ART. 4. THE RED-BELLIED TERRAPIN, *PSEUDEMYS RUBRIVENTRIS* (LE CONTE), IN PENNSYLVANIA*

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(Plate 21)

Proof of the occurrence of *Pseudemys rubriventris* in Pennsylvania has rested, until recently, upon the following evidence:

(a) Le Conte (1830, p. 102), in the original description of the species, stated "in the Delaware, near Trenton, they are very numerous." The Delaware, of course, forms the eastern boundary of Pennsylvania.

(b) In the handwritten *Catalogue of the Testudinata in the Museum of the Academy of Natural Sci., Philadelphia, Pa.,* compiled in September, 1889, by George Baur, the eminent student of turtles, there is the following entry: *"Chrysemys rubiventris,* Le C., [No.] 223, stuffed ♀. Delaware, Philad." This specimen, which has a carapace measuring 199 mm. in length, is still in the Academy collection.

(c) There is a published record for Bristol in Henry W. Fowler's list of amphibians and reptiles of Bucks County (1917, p. 14). During a recent conversation, Mr. Fowler advised me that he based this record upon specimens of *rubriventris* which he had seen exhibited from time to time, about forty years ago, in the window of the Cloosen Haus, a hostelry and restaurant at Bristol, and which were alleged to have been taken in the millpond near by.

In addition to the above apparently valid records, four or five red-bellied turtles have been found in various parts of Philadelphia and brought to the Philadelphia Zoological Garden during the past fifteen years. One of these was stated to have been caught in the Schuylkill River, in Fairmount Park, but it, and all the others at the time they were acquired, had deep, pitted scars on their plastrons, an almost certain indication that they had been held in captivity on concrete or some other substance abrasive to turtle shells. Some were found in business or residential areas far from any streams or ponds. These

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specimens presumably escaped or were released by persons unknown. Since this species is not rare in southern New Jersey, and since it is sometimes offered for sale in Philadelphia fish markets, it is not surprising that these turtles occasionally turn up in unusual places.

Robert Sutcliffe, of the Academy of Natural Sciences of Philadelphia, caught two specimens in Neshaminy Creek, near Trevose, in 1940, but he learned they had been liberated a short time previously by a professional turtle hunter who had obtained them in New Jersey.

Evidence has come to hand recently to indicate that *Pseudemys rubriventris* is well established and may occur naturally in at least three places in the narrow strip of Coastal Plain in extreme southeastern Pennsylvania. These are: (1) The Tinicum Marshes, in the southernmost part of Philadelphia and adjacent Delaware County; (2) Manor Lake, near Tullytown, Bucks County; and (3) Fowler's old locality at Bristol. Several specimens are now available for study. They, with their attendant collecting data, are as follows:

CM 27420 — adult female with carapace measuring 268 mm. in length; Tinicum Marshes, Delaware County, June 18, 1947, collected by Nelson D. Hoy.

CM 29400 — adult male with carapace 285 mm. in length; Manor Lake, Bucks County, August 19, 1950, collected by Dr. Francis J. Trembley.

CM 29457 — adult male with carapace 289 mm. in length; Manor Lake, Bucks County, August 20, 1950, collected by Dr. Francis J. Trembley.

ANSP 26308 — adult male with carapace 242 mm. in length; Manor Lake, Bucks County, December 20, 1950, collected by Edward T. Balderston.

CM 29502 — adult female with carapace 288 mm. in length; Tinicum Marshes, Delaware County, June 24, 1951, collected by Howard Donaghy.

It should be mentioned that some of these turtles, including the one portrayed upon Plate 21, were kept in captivity for weeks or months, and the pits and scars on their plastrons developed after they were collected.

In addition to the above turtles, I have examined the shell of another large specimen, as mentioned below, and there are numerous

sight records for the two localities in Bucks County. Data at hand are herewith summarized:

1. THE TINICUM MARSHES, in the extreme southern part of Philadelphia and adjacent Delaware County. — This area is part of what, in the not distant past, was a very large freshwater marsh bordering the Delaware River and extending for many miles down stream. The marshes lie within the (former) extensive delta system between Darby Creek and the Schuylkill River, and, like the comparable marshes on the New Jersey side, they are partly the result of the gradual rise of the ocean waters and the development of the Delaware River estuary. Dredging operations, industrial expansion, the creation of municipal dumps, and other activities have so encroached upon the marshes that they are considerably reduced in extent. The spot where Mr. Hoy caught the specimen on June 18, 1947, and a nearby pond, where the turtle may have lived, are very close to the Philadelphia International Airport. Any enlargement of this facility would quickly destroy the pond and its environs. Mr. Hoy states that the reptile was on a dirt road about ten feet from the nearest ditch (in which there was some water). There was some evidence that it may have been digging (nesting?), but neither eggs nor definite excavations were found.

The shell of an adult female that had a carapace 299 mm. long was found in another part of the marshes during June, 1947, by Carl Lorup and Nelson D. Hoy. The remains of this reptile, consisting of the shell, the hind legs, and some of the dermal scutes from the carapace and marginals, were lying along a dike that separates Darby Creek from the marshes. It probably had been shot, for there was a round hole in the third right costal. Although most of the scutes had sloughed off the shell, enough of them remained to make out gross details of the pattern. These compared favorably with a large well-marked female *rubriventris* from near Mt. Ephraim, Camden Co., New Jersey, that was alive at the time in the Philadelphia Zoo. The only obvious anomaly was that the dead turtle had thirteen marginals on each side of the shell instead of the normal twelve. This specimen was accidentally discarded.

The turtle found on June 24, 1951, was taken as it crossed a paved road close to the airport. There was a deep, water-filled ditch near by.

A considerable area of marsh still exists, and it is the home of a distinctive flora and fauna. Its remaining years as a wild-life habitat probably will be few, especially in view of the industrial expansion planned for the Philadelphia area, the demand for property along the navigable Delaware River, and the constant onslaughts, through drainage and the application of chemicals, like DDT, against the swarms of mosquitoes that abound in such places.

As pointed out by Miller (1946), the Tinicum Marshes have been repeatedly subjected to drastic changes, ranging all the way from virtually complete drainage in 1917 to severe flooding in 1934. Miller's paper, which is concerned with the Florida gallinule, relates how neglect of the drainage ditches caused the water to rise, with the result that cattails (*Typha*) increased vastly and provided extensive habitats for this member of the rail family. High water doubtless also favored aquatic turtles, such as *Pseudemys*. Even during periods when the marshes were driest, however, water probably remained in at least some of the ditches and sloughs of the region, and turtles also may have survived in the streams if pollution was not too great.

During a recent visit to the Tinicum area with Dr. John M. Fogg, Jr., of the University of Pennsylvania, to whom I am indebted for the botanical observations that follow, we found that considerable portions of the marsh proper are now covered with masses of common reed-grass, *Phragmites communis*. The broad-leafed cattail, *Typha latifolia,* purple loosestrife, *Lythrum salicaria,* and bur marigold, *Bidens coronata,* are also present in abundance in many places. The black willow, *Salix nigra,* grows densely upon the dikes and other elevated spots. Many exotic plants, chiefly European and probably introduced as a by-product of the import commerce of the port of Philadelphia, are well established upon the man-made prairies where silt from dredging operations from the Delaware River has been deposited. The water primrose, *Jussiaea repens,* var. *glabrescens,* which is essentially a neotropical plant and is here at its northernmost known locality, thrives in shallow pools and along the margins of an extensive open marsh.

2. MANOR LAKE, near Tullytown, Bucks County. — This is an artificial body of water occupying the former valley of Scott's Creek. The stream was dammed in 1929, and the dam breast rises about nine

feet above low water level in the Delaware River, which is almost directly adjacent. Approximately 750 acres of water are impounded. Scott's Creek was originally subject to tidal influence, but its waters were always fresh. Its valley, in part, was marshy.

Manor Lake serves as a reservoir for a series of lakes owned by a large builders' supply company. In these, dredging for sand and gravel is carried on almost continually. Water loss, occasioned by evaporation, seepage, etc., is made up by taking water from Manor Lake. To accomplish this, water is pumped into Manor Lake from the Delaware River, and then pumped from the former into the dredge lakes. Manor Lake supports a rich flora and fauna; it is fertilized by leaching and runoff from the surrounding fields, which are intensively cultivated. Dominant plants in the lake include spatterdock, pickerel weed, elodea, white water-lilies, and three species of potomogetons.

The general locality is in the Coastal Plain, and the soil consists of sand and gravel, obviously fluvial in character and probably (at least in part) outwash from glaciers that melted farther north.

The two turtles collected by Dr. Trembley in August, 1950, were taken in a trap net set off the end of one of the points of land jutting out into the lake. Both Dr. Trembley and Edward T. Balderston, manager of the Penn Manor Club, which leases the lake, report having seen a number of these turtles sunning on logs or other objects in the water.

The specimen collected by Mr. Balderston in December, 1950, was taken by chopping a hole through the ice on the surface of the lake. He also obtained a large snapper, *Chelydra s. serpentina,* in the same manner, and he saw three other *Pseudemys* resting on the bottom or on submerged logs. These he did not disturb.

Accompanied by my wife, Mr. Balderston, and two other men, I spent an hour walking about on the ice on December 21, 1950. Because the freeze-up had begun on a still, virtually windless night and had continued through several more quiet nights, the ice was crystal-clear over large areas and visibility to the mud bottom of the lake was excellent. We saw only one *Pseudemys,* which was lying still on the mud in a depth of three or four feet of water. As we walked about we also saw four musk turtles, *Sternotherus odoratus,* and about

twenty-five painted turtles, *Chrysemys p. picta.* Several of these were slowly walking about on the bottom, and two or three painted turtles were swimming, not fast, but fairly rapidly considering how low their body temperatures must have been in the cold water. Others were digging in the mud at the bottom, making small, almost round burrows for themselves; a few others were just emerging from similar burrows.

3. SILVER LAKE, Bristol, Bucks County. — This is the same body of water as the Bristol Millpond mentioned by Fowler. However, it was deepened and "improved" by the Works Progress Administration and given a new name. The lake is formed by a dam across Mill (Otter) Creek just north of the Pennsylvania Railroad main line tracks; it is a long, narrow body of water, slightly in excess of a mile in length, and with some bordering marshland, especially at its upper end and along its eastern shore. Mr. Robert Hendricks, of Bristol, informs me that he has known of the presence of *Pseudemys rubriventris* in this pond since 1916. He reports seeing specimens basking each year during the warmer months, and, as is typically the case with *rubriventris,* he has found them to be very wary and difficult to approach.

In reviewing the distribution of the red-bellied turtle in eastern Pennsylvania, the question inevitably arises whether this reptile occurs naturally in the region or whether it has been introduced by man. The latter possibility cannot be overlooked, but there is considerable evidence, most of it circumstantial, to indicate that *Pseudemys* is indigenous to the area.

First, it should be pointed out that *P. rubriventris* is a common turtle in southern New Jersey. It occurs in marshes on the eastern side of the Delaware River that are quite comparable to the Tinicum Marshes, and it lives in New Jersey streams and ponds that are similar in many respects to Scott's and Otter Creeks, and to Manor and Silver Lakes. Conceivably the Delaware River, burdened as it is today by organic and industrial pollution, might possibly serve as a barrier. But certainly in earlier days, *rubriventris* must have crossed and re-crossed this large stream; Le Conte mentioned its abundance in the river near Trenton 120 years ago (*loc. cit.*). Also, there are the facts that this turtle occurs in the state of Delaware and that the river

marshes, although partly brackish* toward the south, were more or less continuous along the Delaware River estuary before the development of the cities and industries that are strung out along the river from Wilmington to Philadelphia. *Pseudemys* probably could have made its way northward into eastern Pennsylvania by staying completely upon the west side of the Delaware.

Further, there are certain other elements of the fauna of the Coastal Plain of southeastern Pennsylvania that, like *P. rubriventris,* occur nowhere else in the Keystone State although they are common and widespread in southern New Jersey. According to information supplied by Henry W. Fowler and Dr. Reeve M. Bailey, of the University of Michigan Museum of Zoology, there are several fishes that fit this distributional pattern, *viz.* — the Delaware swamp darter, *Hololepis fusiformis erochrous;* the black-banded sunfish, *Mesogonistius chaetodon*; and the mud sunfish, *Acantharcus pomotis.* There is also the chorus frog, *Pseudacris* (collected near Tullytown), which is identical with the chorus frog of southern New Jersey but differs in essentials of pattern from the population of *Pseudacris* occurring in the Piedmont Province of Pennsylvania farther west.

It is quite likely that *Pseudemys rubriventris* was widespread in the Coastal Plain strip of Pennsylvania in pioneer days. The development of the City of Philadelphia and its suburbs has resulted in the destruction of many small streams and large areas of marshland that probably furnished suitable habitats for this turtle. It is possible that the species also may be found in other localities in extreme eastern Pennsylvania. James A. Fowler, of the Academy of Natural Sciences of Philadelphia, saw two large turtles basking in the Springton Reservoir, Delaware County, which he believed to be this species. This locality, however, is in the Piedmont.

Throughout this paper I have used the binomial designation, *Pseudemys rubriventris.* This I have done pending a thorough and detailed study of this complex. Babcock (1937) in assigning a name, *Pseudemys rubriventris bangsi,* to the population of these turtles occurring

* The water in the Delaware River is very slightly brackish, but the amount of salinity is virtually negligible. According to data recently supplied by the U. S. Geological Survey, the averages for the year 1950 were 13 parts of "chloride" per million parts of water at League Island (Philadelphia Navy Yard) and 17 at Eddystone. Normal sea water is 19,000 parts to a million.

in Plymouth County, Massachusetts, diagnosed his new form solely upon the basis of the relative height of the carapace. He stated that in *bangsi* "the greatest height of shell [is] included in its greatest length 2.4 times." He gave the comparable figure for the subspecies *rubriventris* as 2.63 times.

Among sixteen adult female specimens of *Pseudemys rubriventris* from southern New Jersey, the ratios (length of carapace divided by height of shell) vary from 2.21 to 2.72, with a mean of 2.48. The figures for nine adult New Jersey males are 2.39 to 2.93, mean 2.61. Using Babcock's diagnostic ratios, eight New Jersey turtles could be identified as *bangsi* and six could be identified as *rubriventris*. The other eleven specimens have ratios that fall between Babcock's two figures. The ratios for the six Pennsylvania specimens are as follows: Females, 2.47, 2.57 and 2.63; males, 2.54, 2.72 and 2.94.

The New England population may be worthy of subspecific designation, but it is obvious that some character other than shell ratios must be found if the form *bangsi* is to be recognized. The shells of turtles are subject to considerable individual and ontogenetic variation.

Melanism is of quite frequent occurrence among adult New Jersey and Pennsylvania specimens, but many individuals retain strong indications of pattern even when they have grown to large size. In almost all of these turtles (even in the darkest ones) each of the first three costals is marked with a fairly broad vertical brownish or reddish brown line. These lines sometimes are forked, producing inverted "Y's" as may be seen in the specimen illustrated in Plate 21.

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EXPLANATION OF PLATE 21

PHOTOS BY ISABELLE HUNT CONANT

An adult female of *Pseudemys rubriventris* (CM 27420) with a carapace measuring 268 mm. in length. Collected June 18, 1947, in the Tinicum Marshes, Delaware County, Pennsylvania, by Nelson D. Hoy.

FIG. 1. Lateral view.

FIG. 2. Dorsal view.

FIG. 3. Ventral view.